



We Claim:

1. A method of using a bottom hole assembly deployed in a borehole to estimate a formation property continuously specifying the mudweight to be used in a drilling operation, comprising the steps of:
  - (a) generating a source signal from said a bottom hole assembly;
  - (b) detecting at least one receiver signal using said bottom hole assembly;
  - (c) computing a frequency dependent characteristic of said at least one receiver signal; and
  - (d) using said frequency dependent characteristic to estimate as said formation property of a formation in the region of said bottom hole assembly; and
  - (e) using said frequency dependent characteristic to specify said mudweight.
2. The method of claim 2 wherein said tool is a bottom hole assembly comprises of a drilling apparatus.
3. The method of claim 2 wherein said source signal is a noise spectrum generated by a drill bit of said drilling apparatus.

4. The method of claim 3 wherein said step of determining frequency dependence is carried out by cross-correlation analysis.
5. The method of claim 4 wherein said ~~at least one~~ receiver signal comprises a direct formation signal, and wherein said formation surrounds said borehole.
6. The method of claim 4 wherein said ~~at least one~~ receiver signal comprises a reflected signal, and wherein said formation is ahead of said borehole.
7. The method of claim 1 wherein said frequency dependent characteristic is amplitude attenuation.
8. The method of claim 7 wherein said the formation property is pore pressure.
9. The method of claim 8 wherein said pore pressure is estimated from a frequency dependent attenuation relationship.
10. The method of claim 1 wherein said frequency dependent characteristic is wave propagation velocity.
11. The method of claim 10 wherein said formation property is pore pressure.
12. ~~The method of claim 1 wherein said formation property is lithology.~~
13. ~~The method of claim 1 wherein said formation property is fluid content.~~

~~14. The method of claim 1 wherein said formation property is rock strength.~~

~~15. The method of claim 1 wherein said tool is a bottom hole assembly of a measurement while well logging system.~~

*Rule 2c*  
16 ~~16.~~ 12. The method of claim 1 wherein said source signal is generated by an active source located on said bottom hole assembly.

17 ~~17.~~ 13. The method of claim 126 wherein said step of determining frequency dependence is carried out by a frequency component analysis.

18 ~~18.~~ 14. The method of claim 1, wherein said ~~at least one~~ receiver signal comprises a direct borehole signal.

19 ~~19.~~ 15. The method of claim 148 wherein said formation property is permeability.

20 ~~20.~~ 16. A method of continuously estimating the pore pressures of formations ahead of a bottom hole assembly, comprising the steps of

- a) generating a source signal from said bottom hole assembly;
- b) detecting at least one receiver signal using said bottom hole assembly;
- c) using said source signal and said ~~at least one~~ receiver signal to estimate a pore pressure of at least one said formation; and

- Rule 2*
- d) repeating steps a), b), and c) as said bottom hole assembly moves sequentially downward through said formations.

21 1721. A method of continuously monitoring the wellbore pressure safety margin corresponding to formations ahead of a bottom hole assembly, comprising the steps of

- a) generating a source signal from said bottom hole assembly;
- b) detecting at least one receiver signal using said bottom hole assembly;
- c) using said source signal and said receiver signal to determine a pore pressure of said formation;
- d) using said pore pressure to monitor said wellbore pressure safety margin; and
- e) repeating steps a), b), c) and d) as said bottom hole assembly moves sequentially downward through said formations.

22 1822. A method of continuously optimizing the weight of drilling mud used in a drilling operation, comprising the steps of

- a) generating a source signal from a bottom hole assembly;
- b) detecting at least one receiver signal using said bottom hole assembly;

- c) using said source signal and said at least one receiver signal to determine a pore pressure of a formation ahead of said bottom hole assembly; and
- d) using said pore pressure to specify a weight of said drilling mud which corresponds to a target wellbore pressure safety margin..